

Notice of Allowability

Application No.

10/622,781

Examiner

Esaw T. Abraham

Applicant(s)

YUN ET AL.

Art Unit

2133

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to amdt filed on 10/31/05.
2. ☒ The allowed claim(s) is/are 21-40, 42-82 (renumbered as 1-61).
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date 09/24/04, 10/31/05
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413),
Paper No./Mail Date 12/28/05
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

APPROVED FOR SIGNATURE
EXAMINER
A. S. E. C. A. S. Y.

DETAILED ACTION

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and or additions be acceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312.

To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Attorney Craig Schmoyer on 12/28/05.

2. The application has been amended as follows:

As per claim 49:

Change the phrase "the interleaver" to ---interleaving means--- (see line 6 of claim 49).

Change the phrase "the interleaver" to ---interleaving means--- (see line 8 of claim 49).

As per claim 50:

Change the phrase "The device according to claim 48 or claim 49 to ---The device according to claim 49--- (see line 1 of claim 50).

Add the word ---columns--- next to the phrase "any one of 1, 2, 4 and 8" (see line 2 of claim 50).

Examiner's statement for reason for allowance

3. Claims **33-39** have been previously allowed.

4. Claims **21-32, 40, 42-82** have been allowed.

The following is an examiner's statement for allowance:

Art Unit: 2133

As per claim 21:

The prior art, Gelblum et al (U.S. PN: 6,088,387) of record teach an apparatus and a method for transmitting turbo-encoded data in a multi-tone channel (see abstract) comprising performing a channel coding and outputting channel-coded sequences (see col. 2, lines 6-11 and col. 4, lines 27-35), constructing a first interleaving pattern (see fig. 1, element 16 and col. 3, last paragraph), constructing virtual (uniform) interleaving patterns by considering a mapping data with a corresponding first interleaving pattern (see col. 4, lines 8-21) and puncturing bits in the first interleaving pattern constructed in the virtual (uniform) interleaving pattern (see col. 4, lines 51-56). However, the prior art taken singly or in combination fail to teach, anticipate, suggest, or render obvious rate matching method for uplink of a mobile telecommunication system, comprising: interleaving a plurality of turbo coded bits including a first bit sequence, a second bit sequence, and a third bit sequence at an intetreaver calculating a first shifting parameter value to the second bit sequence for each column of the interleaver carrying out the intetleaving step; calculating a second shifting parameter value to the third bit sequence for each column of the interleaver carrying out the interleaving step; and deciding a rate matching pattern for each of the second bit sequence and the third parity bit sequence by using the shifting parameter values.

Consequently, claim 21 is allowed over the prior art.

Claims 22-32, which is/are directly or indirectly dependent/s of claim 21 are also allowable over the prior art of record.

Claims 33-39 have been previously allowed.

As per claim 40:

The prior art, Gelblum et al (U.S. PN: 6,088,387) of record teach an apparatus and a method for transmitting turbo-encoded data in a multi-tone channel (see abstract) comprising performing a channel coding and outputting channel-coded sequences (see col. 2, lines 6-11 and col. 4, lines 27-35), constructing a first interleaving pattern (see fig. 1, element 16 and col. 3, last paragraph), constructing virtual (uniform) interleaving patterns by considering a mapping data with a corresponding first interleaving pattern (see col. 4, lines 8-21) and puncturing bits in the first interleaving pattern constructed in the virtual (uniform) interleaving pattern (see col. 4, lines 51-56). However, the prior art taken singly or in combination fail to teach, anticipate, suggest, or render obvious rate matching method for uplink of a mobile telecommunication system, comprising: interleaving a plurality of turbo coded bits including a plurality of systematic bits, a plurality of first parity bits, and a plurality of second parity bits at an interleaver, constructing a first virtual interleaving pattern with the first parity bits; constructing a second virtual interleaving pattern with the second parity bits; calculating at least one first shifting parameter value to the first virtual interleaving pattern and at least one second shifting parameter value to the second virtual interleaving pattern, and carrying out a rate matching algorithm to the output bits of the interleaver by using the shifting parameter values, wherein $n = (3k + 1) \bmod K$ is for the first virtual interleaving pattern, and $n = (3k + 2) \bmod K$ is for the second virtual interleaving pattern, wherein n represents a column index of the virtual interleaving pattern, k is a column index of the interleaving pattern, and K is a number of columns of the interleaver. Consequently, claim 40 is allowed over the prior art.

Claims 42-47, which is/are directly or indirectly dependent/s of claim 40 are also allowable over the prior art of record.

Art Unit: 2133

As per claim 48:

The prior art, Gelblum et al (U.S. PN: 6,088,387) of record teach an apparatus and a method for transmitting turbo-encoded data in a multi-tone channel (see abstract) comprising performing a channel coding and outputting channel-coded sequences (see col. 2, lines 6-11 and col. 4, lines 27-35), constructing a first interleaving pattern (see fig. 1, element 16 and col. 3, last paragraph), constructing virtual (uniform) interleaving patterns by considering a mapping data with a corresponding first interleaving pattern (see col. 4, lines 8-21) and puncturing bits in the first interleaving pattern constructed in the virtual (uniform) interleaving pattern (see col. 4, lines 51-56). However, the prior art taken singly or in combination fail to teach, anticipate, suggest, or render obvious rate matching method for uplink of a mobile telecommunication system, comprising: a rate matching device for uplink of a mobile telecommunication system, comprising: means for interleaving a plurality of turbo coded bits including a first bit sequence, a second bit sequence, and a third bit sequence', and means for calculating at least one shifting parameter for each of the interleaved second and third bit sequences, and deciding a rate matching pattern to each bit sequence by using the shifting parameters. Consequently, claim 48 is allowed over the prior art.

As per claim 49:

The prior art, Gelblum et al. (U.S. PN: 6,088,387) of record teach an apparatus and a method for transmitting turbo-encoded data in a multi-tone channel (see abstract) comprising performing a channel coding and outputting channel-coded sequences (see col. 2, lines 6-11 and col. 4, lines 27-35), constructing a first interleaving pattern (see fig. 1, element 16 and col. 3, last paragraph), constructing virtual (uniform) interleaving patterns by considering a mapping data with a

Art Unit: 2133

corresponding first interleaving pattern (see col. 4, lines 8-21) and puncturing bits in the first interleaving pattern constructed in the virtual (uniform) interleaving pattern (see col. 4, lines 51-56). However, the prior art taken singly or in combination fail to teach, anticipate, suggest, or render obvious a rate matching device for uplink of a mobile telecommunication system, comprising means for interleaving a plurality of turbo coded bits including a systematic bit sequence, a first parity bit sequence, and a second parity bit sequence; and means for providing a first shifting parameter corresponding to a column having a wireless frame number of $(3k+1)\text{mod}K$ of the interleaver for the first parity bit sequence, and providing a second shifting parameter corresponding to a column having a wireless frame number of $(3k+1)\text{mod}K$ of the interleaver for the second parity bit sequence, and means deciding a rate matching pattern of the interleaved output by using the provided shifting parameters, wherein k is an integer in a range of $0 \leq k < K$, and K is a number of columns of the interleaving means. Consequently, claim 49 is allowed over the prior art.

Claim 50, which is/are directly or indirectly dependent/s of claim 49 are also allowable over the prior art of record.

As per claim 51:

The prior art, Gelblum et al (U.S. PN: 6,088,387) of record teach an apparatus and a method for transmitting turbo-encoded data in a multi-tone channel (see abstract) comprising performing a channel coding and outputting channel-coded sequences (see col. 2, lines 6-11 and col. 4, lines 27-35), constructing a first interleaving pattern (see fig. 1, element 16 and col. 3, last paragraph), constructing virtual (uniform) interleaving patterns by considering a mapping data with a corresponding first interleaving pattern (see col. 4, lines 8-21) and puncturing bits in the

Art Unit: 2133

first interleaving pattern constructed in the virtual (uniform) interleaving pattern (see col. 4, lines 51-56). However, the prior art taken singly or in combination fail to teach, anticipate, suggest, or render obvious rate matching method for uplink of a mobile telecommunication system, comprising: determining a rate between an input bit sequence and a number of repetition bits; determining an average repetition distance variable value in response to the determined rate; and calculating a shifting parameter for deciding a repetition position per each column of an interleaver to the input bit sequence for interleaving by using the calculated variable value. Consequently, claim 51 is allowed over the prior art.

Claims 52-55, which is/are directly or indirectly dependent/s of claim 51 are also allowable over the prior art of record.

As per claim 56:

The prior art, Gelblum et al (U.S. PN: 6,088,387) of record teach an apparatus and a method for transmitting turbo-encoded data in a multi-tone channel (see abstract) comprising performing a channel coding and outputting channel-coded sequences (see col. 2, lines 6-11 and col. 4, lines 27-35), constructing a first interleaving pattern (see fig. 1, element 16 and col. 3, last paragraph), constructing virtual (uniform) interleaving patterns by considering a mapping data with a corresponding first interleaving pattern (see col. 4, lines 8-21) and puncturing bits in the first interleaving pattern constructed in the virtual (uniform) interleaving pattern (see col. 4, lines 51-56). However, the prior art taken singly or in combination fail to teach, anticipate, suggest, or render obvious rate matching method for uplink of a mobile telecommunication system, comprising: comparing a puncturing rate per column of each virtual interleaving pattern with 50% of a reference puncturing rate; calculating a different puncturing distance q per column of

Art Unit: 2133

each virtual interleaving pattern, in response to whether the puncturing rate per column is equal to or greater than the reference puncturing rate and whether the puncturing rate per column is less than the reference puncturing rate; calculating a shifting parameter value by using the puncturing distance q ; and deciding a puncturing position in the virtual interleaving pattern by using the shifting parameter value. Consequently, claim 56 is allowed over the prior art.

Claims 57-59, which is/are directly or indirectly dependent/s of claim 56 are also allowable over the prior art of record.

As per claim 60:

The prior art, Gelblum et al (U.S. PN: 6,088,387) of record teach an apparatus and a method for transmitting turbo-encoded data in a multi-tone channel (see abstract) comprising performing a channel coding and outputting channel-coded sequences (see col. 2, lines 6-11 and col. 4, lines 27-35), constructing a first interleaving pattern (see fig. 1, element 16 and col. 3, last paragraph), constructing virtual (uniform) interleaving patterns by considering a mapping data with a corresponding first interleaving pattern (see col. 4, lines 8-21) and puncturing bits in the first interleaving pattern constructed in the virtual (uniform) interleaving pattern (see col. 4, lines 51-56). However, the prior art taken singly or in combination fail to teach, anticipate, suggest, or render obvious rate matching method for uplink of a mobile telecommunication system, comprising: A rate matching method for an uplink of a mobile communication system, comprising: deciding a puncturing rate by using a number of bits to be punctured to a number of input bits; comparing the puncturing rate with 50% of a reference puncturing rate; calculating different puncturing distances q' in response of the compared calculating a shifting parameter

Art Unit: 2133

value by using the puncturing distance q' , and carrying out a puncturing process by using the calculated shifting parameter value. Consequently, claim 60 is allowed over the prior art.

Claims **61-67**, which is/are directly or indirectly dependent/s of claim 60 are also allowable over the prior art of record.

As per claim 68:

The prior art, Gelblum et al (U.S. PN: 6,088,387) of record teach an apparatus and a method for transmitting turbo-encoded data in a multi-tone channel (see abstract) comprising performing a channel coding and outputting channel-coded sequences (see col. 2, lines 6-11 and col. 4, lines 27-35), constructing a first interleaving pattern (see fig. 1, element 16 and col. 3, last paragraph), constructing virtual (uniform) interleaving patterns by considering a mapping data with a corresponding first interleaving pattern (see col. 4, lines 8-21) and puncturing bits in the first interleaving pattern constructed in the virtual (uniform) interleaving pattern (see col. 4, lines 51-56). However, the prior art taken singly or in combination fail to teach, anticipate, suggest, or render obvious calculating a specific parameter R by performing a modular operation of a predetermined number of bits required for rate matching to a number of input bits N ; if the parameter R value is not equal to 0 and if a value twice the parameter R value is equal to or less than the number of input bits, calculating a distance q for the rate matching as a minimum integer equal to or greater than a value obtained by dividing the number of input bits N by the parameter R ; if a value twice the parameter R value exceeds the number of input bits, calculating a distance q for the rate matching as a minimum integer equal to or greater than a value obtained by dividing the number of input bits N by a subtracted value of the number of input bits N from the parameter R value; calculating a shifting parameter S for deciding a bit position in a rate

Art Unit: 2133

matching pattern by using the distance q for the rate matching; and carrying out a rate matching algorithm by using the shifting parameter S . Consequently, claim 68 is allowed over the prior art.

As per claim 69:

The prior art, Gelblum et al (U.S. PN: 6,088,387) of record teach an apparatus and a method for transmitting turbo-encoded data in a multi-tone channel (see abstract) comprising performing a channel coding and outputting channel-coded sequences (see col. 2, lines 6-11 and col. 4, lines 27-35), constructing a first interleaving pattern (see fig. 1, element 16 and col. 3, last paragraph), constructing virtual (uniform) interleaving patterns by considering a mapping data with a corresponding first interleaving pattern (see col. 4, lines 8-21) and puncturing bits in the first interleaving pattern constructed in the virtual (uniform) interleaving pattern (see col. 4, lines 51-56). However, the prior art taken singly or in combination fail to teach, anticipate, suggest, or render obvious a rate matching method for unlink wireless communication comprising optimizing a parameter of a parallel puncturing algorithm, in a rate matching for each bit sequence in accordance with a channel coded bit sequence divided into a first bit sequence (x), a second bit sequence (y), and a third bit sequence (z), comprising: when carrying out a parallel puncturing process for each bit sequence, using a parameter for controlling a position of a puncturing code bit, to exclude the first bit sequence (x) from the puncturing process, and to serially and alternately perform the puncturing process on the second bit sequence (y) and the third bit sequence (z). Consequently, claim 69 is allowed over the prior art

Claims 70-73, which is/are directly or indirectly dependent/s of claim 69 are also allowable over the prior art of record.

As per claim 74:

The prior art, Gelblum et al (U.S. PN: 6,088,387) of record teach an apparatus and a method for transmitting turbo-encoded data in a multi-tone channel (see abstract) comprising performing a channel coding and outputting channel-coded sequences (see col. 2, lines 6-11 and col. 4, lines 27-35), constructing a first interleaving pattern (see fig. 1, element 16 and col. 3, last paragraph), constructing virtual (uniform) interleaving patterns by considering a mapping data with a corresponding first interleaving pattern (see col. 4, lines 8-21) and puncturing bits in the first interleaving pattern constructed in the virtual (uniform) interleaving pattern (see col. 4, lines 51-56). However, the prior art taken singly or in combination fail to teach, anticipate, suggest, or render obvious a rate matching method for unlink wireless communication comprising optimizing a parameter of a parallel puncturing algorithm, in a rate matching algorithm for a turbo coded systematic bit sequence, a turbo coded first parity bit sequence, and a turbo coded second parity bit sequence, comprising: interleaving at least the first and the second parity bit sequences, determining first and second shifting parameters for the first and the second parity bit sequences, wherein the first and the second shifting parameters are determined by using virtual interleaving patterns, wherein $n = (3k + 1) \bmod K$ is for the first virtual interleaving pattern and $n = (3k + 2) \bmod K$ is for the second virtual interleaving pattern. wherein n represents a column index of the virtual interleaving pattern, $\#$ is a column index of the interleaving pattern, and K is a number of columns of the interleaver and deciding different parameter (a) values for puncturing the first parity bit sequence and the second parity bit sequence, to puncture at least one bit corresponding to the first and second parity bit sequences in a specific symbol of a punctured output. Consequently, claim 74 is allowed over the prior art

Art Unit: 2133

Claims 75-82, which is/are directly or indirectly dependent/s of claim 74 are also allowable over the prior art of record.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

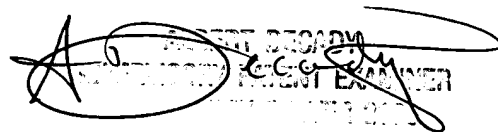
5. Any inquiry concerning this communication or earlier communication from the examiner should be directed to Esaw Abraham whose telephone number is (571) 272-3812. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are successful, the examiner's supervisor, Albert DeCady can be reached on (571) 272-3819. The fax phone numbers for the organization where this application or proceeding is assigned (571) 273-8300.

Information regarding the status of an Application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or PUBLIC PAIR. Status information for unpublished applications is available through Private Pair only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Esaw Abraham

Art unit: 2133

A handwritten signature, likely of Esaw Abraham, is written over a circular official stamp. The stamp contains the text "PATENT RECORD" at the top and "REGISTERED PATENT EXAMINER" at the bottom, with some smaller, less legible text in the center. The signature is written in dark ink and is somewhat stylized.